CHEM-1105   COLLIGATIVE PROPERTIES

1. Calculate the mass percent, molality, and molarity of glycerine, $C_3H_5(OH)_3$. in a solution prepared by dissolving 45.0 g of glycerine in 100.0 g of water. The density of the solution is 1.27 g/mL. **[31.0%, 4.89 m, 4.29 M]**

2. Citric acid, $H_3C_6H_5O_7$, occurs in plants. Lemons contain 5 to 8 % of citric acid by mass. The acid is added to beverages and candy. An aqueous solution is 0.710 m in citric acid. The density of the solution is 1.049 g/mL. What is the molar concentration? **[0.655 M]**

3. Isopropyl alcohol, C_3H_8O, is used as an antifreeze in windshield washers. What volume of isopropyl alcohol (density= 0.79 g/mL) should be added to 1.00 L of water to give a solution which would not freeze above -20°C? **[820 mL]**

4. When 2.56 g of powered sulfur is dissolved in 100 g of naphthalene (K_f = 6.80°C/m), the freezing point of the mixture is lower than the freezing point of pure naphthalene by 0.680°C. Calculate the molecular formula of sulfur. **[S$_8$]**

5. Pure benzene freezes at 5.50°C and its K_f is 5.10°C/m. Calculate the molar mass of a compound if a solution of 10.0 g of it dissolved in 100.0 g of benzene froze at 5.00°C. **[1020 g/mol]**

6. Butylated hydroxytolune (BHT) is used as an antioxidant in processed foods. It prevents fats and oils from becoming rancid. A solution of 2.500 g of BHT in 100.0 g benzene has afreezing point of 4.88°C. Calculate the molar mass of BHT. **[206 g/mol]**

7. An aqueous solution freezes at -2.47°C. What is its boiling point? **[100.68°C]**

8. 16.9 g of a compound in 250 g of water produces a solution that freezes at -0.744°C. The compound is composed of 57.2% C, 4.77% H, and the rest is oxygen. Calculate the empirical and molecular formulas of the compound. **[C$_2$H$_2$O, C$_8$H$_8$O$_4$]**